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Original article

Subtrochanteric femoral fractures treated with the Long Gamma3® nail: A historical control case study versus Long trochanteric Gamma nail®

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ABSTRACT

Background: Gamma nail was developed for the treatment of subtrochanteric hip fractures. Despite its advantages over extramedullary devices, gamma nail has been historically related to significant complications (implant breakage, femoral fractures at the tip of the nail). There is limited data to determine if the rate of these complications was minimized by using a new design of the gamma nail. Therefore we performed a case control study between the long gamma3 nail (LG3N) and the long trochanteric gamma nail (LTGN) to assess if: (1) the complication rate in the treatment of subtrochanteric fractures using the LG3N was lower than the one using the LTGN; (2) the reoperation rate was lower after using the LG3N.
Hypothesis: The complication rate after fixation of subtrochanteric fracture of the femur is lower with LG3N than with the LTGN.
Patients and methods: This study prospectively recorded the intra- and postoperative complications of 75 patients with subtrochanteric fractures treated with the LG3N and compared them with those of a historical cohort of 83 patients treated with the LTGN. The two groups were matched regarding age, gender and fracture type. Patients with open, pathological, or impending fractures were excluded.
Results: Intraoperative complications in the LG3N group were lower (4 cases, 5.3%) compared with those in the LTGN group (9 cases, 10.8%; $P = 0.04$). The major intraoperative complication encountered with the use of LTGN was fracture of the femur in 3 cases. We encountered in total 9 postoperative complications in LG3N (12%) and 20 in group LTGN (24%). The most frequent complication in both groups was the cut out of the lag screw (3 cases in LG3N and 7 cases in LTGN group). The overall reoperation rate was higher in LTGN group (20.4% vs 10.6%; $P = 0.03$).
Conclusion: As a result of the improvement of its mechanical characteristics, LG3N has proved a safe and efficient implant for the treatment of subtochanteric fractures. The new design seems superior to previous generation, giving promising outcomes, reduced mechanical complication rates, and reduced reoperation rate.
Level of evidence: Level III – case controlled study.

1. Introduction

The long gamma nail (LGN) was introduced in 1992 (HOWMEDICA – OSTEONICS, Rutherford, USA) and was used for subtrochanteric and combined trochanteric-diaphyseal fractures of the femur with good results [1,2]. The second generation, the long trochanteric gamma nail (LTGN), was introduced in 1997 with modifications of standard proximal diameter of 17 mm, distal diameter of 11 mm and reduced medio-lateral curvature from 10° to 4° [3]. These significantly decreased the rates of complications [4–6]. The latest modification, the LG3N (Stryker Trauma GmbH, Schonkichen, Germany), was introduced in 2003. In comparison with its predecessor, it is narrower proximally (15.5 mm), has a reduced antecurvature radius of R2.0 m of the femoral shaft and the same medio-lateral curvature, but with its apex positioned more distally. The lag screw shape has also been improved in the area of the thread and the cutting flutes at the tip of the screw.

The use of intramedullary devices has been the gold standard of treatment of subtrochanteric fractures in the recent years due to its advantages over extramedullary devices [7]. Despite its advantages, intramedullary nails have been related to significant complications, such as implant breakage and femoral fractures at the tip of the nail,

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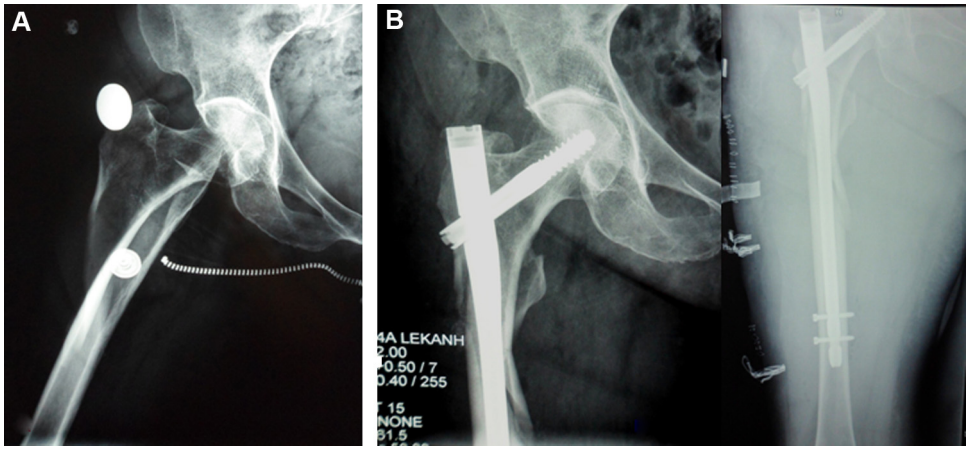

Fig. 1. Right femoral subtrochanteric fracture Seinsheimer type III (A) treated with a LG3N (B).

which eventually require revision surgery [8–11]. However, there is limited evidence specifically evaluating the outcomes following the use of LG3N in the treatment of subtrochanteric fractures.

The present case controlled study was prospectively designed to compare the complication and reoperation rates in the treatment of subtrochanteric fractures using the LG3N with those of a historical cohort treated with the LTGN. The goal of the study was to answer the following questions:

- is the complication rate in the treatment of subtrochanteric fractures using the LG3N lower than the one using the LTGN?
- Is the reoperation rate lower after using the LG3N?

Our working hypothesis was that the LG3N resulted in a lower incidence of intra- and post-operative complications compared to LTGN.

2. Patients and methods

2.1. Patients

Between 2007 and 2010, 75 patients with subtrochanteric fractures, were treated surgically with LG3N (group LG3N) (Fig. 1). The study was a prospective non-randomized study comparing with a historical control group (group LTGN), consisted of 83 patients treated with LTGN (Fig. 2) through the period 2000–2005.

Closed femoral fractures of the subtrochanteric region were included in the study and classified according to Seinsheimer classification [12] (Table 1). Exclusion criteria were open and pathological fractures, prophylactic nailing, and fractures treated at the first year after the introduction of both implants in the Department (excluding the learning curve period for the surgeons).

2.2. Methods

All operations were performed by 4 orthopaedic specialists with global knowledge of the principles of intramedullary nailing and experience in the use of gamma nails. The method of treatment was similar to both groups. Patients were positioned supine on traction table and closed reduction of fracture obtained under fluoroscopic control. All LTGN and LG3N used were made of titanium alloy. The entry point was the same for both types of nail. It was first identified by palpation with the surgeon's index finger at the tip of greater trochanter, at the junction of the anterior third and posterior two thirds through a small skin incision, following by fluoroscopic control of the position of the owl. Intramedullary canals were reamed

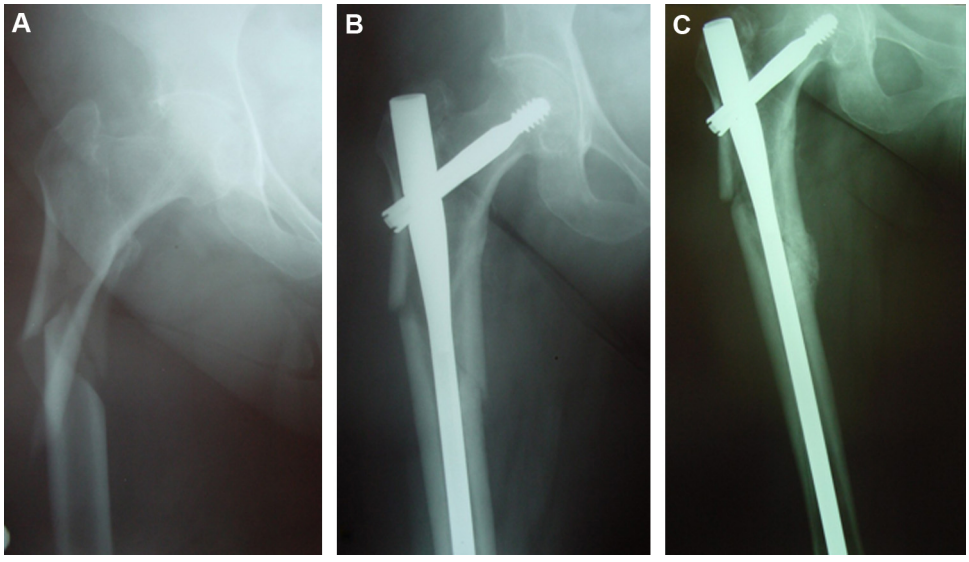

Fig. 2. Right femoral subtrochanteric fracture Seinsheimer type III (A) treated with a LTGN. Reduction and lag screw position considered as proper (B). 3 m postop AP radiograph revealed a good outcome with fracture union (C).